

REMARKS

The Examiner rejected Claims 1, 2, 7 and 8 under 35 U.S.C. 102(b) as being anticipated by Mendez, *et al* (hereafter "Mendez")(US 5,079,774). Applicant traverses this rejection. The Examiner has the burden of showing by reference to the cited art each claim limitation in the reference. Anticipation under 35 U.S.C. 102 requires that each element of the claim in issue be found either expressly or inherently in a single prior art reference. *In re King*, 231 USPQ 136, 138 (Fed. Cir. 1986); *Kalman v. Kimberly-Clark Corp.*, 218 USPQ 781, 789 (Fed. Cir. 1983). The mere fact that a certain thing may result from a given set of circumstances is not sufficient to sustain a rejection for anticipation. *Ex parte Skinner*, 2 USPQ2d 1788, 1789 (BdPatApp&Int 1986). "When the PTO asserts that there is an explicit or implicit teaching or suggestion in the prior art, it must indicate where such a teaching or suggestion appears in the reference" (*In re Rijckaert*, 28 USPQ2d, 1955, 1957). Under the doctrine of inherency, if an element is not expressly disclosed in a prior art reference, the reference will still be deemed to anticipate a subsequent claim if the missing element "is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Cont'l Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749(Fed. Cir. 1991). "Inherent anticipation requires that the missing descriptive material is 'necessarily present,' not merely probably or possibly present, in the prior art." *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1295, 63 USPQ2d 1597, 1599(Fed. Cir. 2002) (quoting *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999)).

With reference to Claims 1 and 7, the Examiner maintains that Mendez discloses a device having an active layer with a n-p junction. The Examiner does not point to any teaching in Mendez that the polarization field in this junction ("has an orientation such that said polarization field is directed from said n-layer to said p-layer"). Since Mendez does not even discuss the polarization field of the n-p junction in the active layer taught therein, Applicant must assume that the Examiner is arguing that this feature is inherent in the device taught in Mendez. In this regard, the Examiner argues that Applicant states that a reversed-biased tunnel diode can be used to provide this feature and that Mendez teaches a reversed-biased junction that provides an electric field sufficient to switch the polarization of the output radiation.

First, Applicant must point out that the cited passage in Applicant's disclosure refers to constructing a device in which the layers are ordered in a manner other than the conventional manner used in GaN semiconductor light emitting devices. The inclusion of the reversed-biased tunnel diode junction allows one to change the conventional ordering of the layers in these devices. Second, the reversed-biased tunnel diode junction is not the junction of the active layer that has the claimed polarization field direction. Finally, Applicant must respectfully point out that Mendez does not teach a device having a reversed-biased **tunnel diode junction**. In fact, the Examiner admits that Mendez does not teach a tunnel diode junction in the argument supporting the rejection of Claim 3 discussed below. Mendez teaches a device in which an applied electric field is utilized to alter the direction of polarization of the light emitted by the device, not the direction of the polarization field in the active region. Accordingly, Applicant submits that the Examiner has not made a *prima facie* case for anticipation with respect to Claims 1 and 7 or the claims dependent therefrom.

The Examiner rejected Claims 4 and 5 under 35 U.S.C. 103(a) as being unpatentable over Mendez (US 5,079,774). Applicant traverses this rejection. Applicant repeats the arguments made above with respect to the teachings of Claims 1 and 7 that are not shown in Mendez. "The mere fact that a reference could be modified to produce the patented invention would not make the modification obvious unless it is suggested by the prior art." (*Libbey-Owens-Ford v. BOC Group*, 4 USPQ 2d 1097, 1103). A statement that modifications of the prior art to meet the claimed invention would have been "well within the ordinary skill of the art at the time the claimed invention was made" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993).

In making this rejection, the Examiner admits that Mendez does not teach a reversed c-axis GaN base layer. The Examiner attempts to avoid this lack of teaching in Mendez by arguing that GaN base layers having a reversed c-axis are known, and hence, it would be obvious to utilize such a layer in constructing a device. However, the Examiner has not pointed to any teaching in the art, other than the present disclosure, that would cause someone

of ordinary skill to make the required modifications to the teachings of Mendez. Since the Examiner, not the Applicant, has the burden here, Applicant submits that the Examiner has not made a *prima facie* case for obviousness with reference to Claim 4 or the claims dependent therefrom.

Regarding Claim 5, the Examiner stated that molecular beam epitaxial deposition is a known method in the art of growing crystals for semiconductor devices. Once again, the Examiner has not pointed to any teaching in the art that would cause someone of ordinary skill to use this particular method in the device taught in Mendez. Hence, there are additional grounds for allowing Claim 5.

The Examiner rejected Claim 3 under 35 U.S.C. 103(a) as being unpatentable over Mendez as applied to Claim 1 above, and further in view of Holonyak, Jr. (US Pat 6,369,403, "Holonyak"). Applicant traverse this rejection and repeats the arguments made above with respect to the teaching missing from Mendez and the lack of motivation to make changes in those teachings.

In making this rejection, the Examiner admits that Mendez does not teach a reverse biased tunnel diode junction. The Examiner looks to Holonyak for the teaching of a semiconductor device comprising a reversed-biased tunnel diode junction. The Examiner maintains that it would have been obvious to one of ordinary skill in the art at the time of the invention to include a tunnel junction in Mendez as taught by Holonyak to facilitate the transferring of electrons through the diode for more efficient output.

It should be noted that the tunnel junction taught in Mendez is above the active region. If one were to combine the teachings of the two references, the resulting device would have a tunnel junction above the active region. That is, the active region would be a p-i-n structure with the n side closest to the substrate. This orientation is the same as that utilized in conventional GaN light emitting devices. As discussed in the present application, the resulting polarization field in such an active region still does not meet the limitations of Claim 1. Hence, the device obtained by combining the teachings of the cited references would not satisfy the limitations of Claim 1 or Claim 3. Accordingly, Applicant submits that the Examiner has not made a *prima facie* case for obviousness with reference to Claim 3.

The Examiner rejected Claims 6 and 11 under 35 U.S.C. 103(a) as being unpatentable over Mendez as applied to Claims 1 and 7 respectively, and further in view of Anayama, *et al* (hereafter "Anayama") (US 5,799,027). Applicant traverses this rejection and repeats the arguments made above with respect to the missing teachings in Mendez. Applicant submits that Anayama does not provide these missing teachings.

In making this rejection, the Examiner admits that Mendez does not teach an angled active layer. The Examiner looks to Anayama for the missing teaching. Specifically, the Examiner points to Figure 1 of Anayama. Claims 6 and 11 require that said substrate has a planar surface on which said layers are grown and wherein said active layer is grown on a surface that is tilted at an angle with respect to said substrate. The substrate shown in Figure 1 of the reference is not a planar surface, but rather a surface having a number of planar facets at angles to one another. The active layer likewise has a faceted structure and is grown on a surface that is parallel to this substrate surface. Hence, the layers taught in Anayama do not satisfy the limitations of Claims 6 and 11. Accordingly, Applicant submits that there are additional grounds for allowing Claims 6 and 11.

The Examiner rejected Claims 9 and 10 under 35 U.S.C. 103(a) as being unpatentable over Mendez as applied to claim 7 above, and further in view of Smith, *et al* (hereafter "Smith") ("Determination of wurtzite GaN..."). Applicant traverses this rejection and repeats the arguments made above with respect to the missing teachings in Mendez. Applicant submits that Smith does not provide these missing teachings.

In making this rejection, the Examiner admits that Mendez does not teach the specific growing method of a GaN seed layer. The Examiner looks to Smith as providing the missing teaching. According to the Examiner, Smith teaches in the abstract the properties of the Ga side of the crystal and the N side of the crystal. Therefore, the Examiner maintains that it would have been obvious to one of ordinary skill in the art at the time of the invention to determine the optimum side of the crystal (normal or reversed) on which to grow the semiconductor layers.

Claim 9 requires that said base layer is generated by growing a GaN seed layer having a top and bottom surface, said bottom surface being in contact with a substrate that causes said GaN layer to have a crystal orientation in the wurtzite c-axis direction; removing said seed layer from said substrate; and growing said base layer on said bottom surface of said seed layer. At most, Smith teaches that the N and Ga faces have different properties. There is no teaching in Smith of growing a layer of GaN on a substrate, removing the layer, turning the layer over, and then growing another layer on it. Applicant submits that, absent the present disclosure as a guide, there is no motivation in the cited references for altering the teachings of Smith to arrive at the limitations of Claims 9 and 10. Accordingly, Applicant submits that there are additional grounds for allowing Claims 9 and 10.

I hereby certify that this paper is being sent by FAX to 703-872-9318.

Respectfully Submitted,



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